Could BPRS be a useful tool for the dimensional approach in schizophrenia?

BPRS can be a useful tool for the dimensional approach in schizophrenia

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Abstract

Aim: The aim of this study is to investigate the symptom dimensions of patients with schizophrenia, who were grouped according to demographic variables, using BPRS.

Materials and Methods: BPRS was applied to 199 patients who were diagnosed with schizophrenia. We divided the participants into three groups according to their ages as follows: (1) 18-34 (n=87; 43.72%), (2) 35-44 (n=56; 28.14%), (3) 45 and above (n=56; 28.14%). Principal component analysis with varimax rotation was used for exploratory factor analysis. The factors were selected on the basis of an eigenvalue > 1.

Results: A five-factor solution was explaining the total variance in whole sample groups. In patients aged between 18-34 years, the PCA resulted in a five-factor solution explaining 69.20% of the total variance. In patients aged between 35-44 years, six factors were extracted accounting for 67.77% of the total variance. For patients aged 45 and above, a six-factor solution was evident explaining 67.91% of the total variance.

Discussion: The items explained by the BPRS scale for ages between 18-34 years, between 35-44 years, and over 45 years were containing only the first 3 factors (positive, negative, and mania), and then differed particularly in the group over 45 years of age. Further studies are needed to support the findings of this study.

Keywords

Schizophrenia; Dimensional approach; Symptom dimension

Introduction

Schizophrenia is a chronic and heterogeneous psychiatric disorder [1]. The importance of understanding the dimensional approach for the diagnosis of schizophrenia at a clinical level was accepted in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [2,3].

There is a classification based on process and severity definitions in DSM. It is stated that there are symptoms within the scope of emotional, cognitive, and behavioral dysfunctions as diagnostic criteria for schizophrenia [2]. Factorial studies of the scales used for assessing the presence and severity of symptoms are mostly conducted in reliability studies. There are a few studies on the evaluation of clinical appearance and symptom dimensions in schizophrenia [4]. Although BPRS is one of the first developed scales, it has been used less than scales such as SANS, SAPS, and PANSS, which mainly focus on thought and perception disorders. Because of evaluating different sets of symptoms such as behavioral, cognitive and mood, we aimed in our study, to evaluate symptom dimensions in schizophrenia. Since BPRS can also evaluate different sets of symptoms such as behavioral, cognitive, and mood, we preferred to use BPRS in this study to evaluate symptom dimensions in schizophrenia. Defining different dimensions in this disorder, which is considered to be heterogeneous, may provide new openings to the studies.

The basis of this approach is based on previous studies in the literature. After the empirical distinction between "positive" and "negative" presented by Andreasen and Olsen (1982), the dimension/factor approach, which is based on the clustering of symptoms that may be related to each other, has been widely used [5]. Subsequent studies supported the 3-dimensional model (positive/psychotic, psychomotor poverty/negative, and disorganization dimensions) proposed by Liddle (1987) instead of positive-negative dichotomy [6,7]. The subtypes of schizophrenia were removed with DSM-5 due to being not useful in predicting the prognosis of the disorder. Instead of considering the concept of schizophrenia as a categorical formation, the symptoms of the disorder are evaluated by the dimensional structure in DSM-5 [8]. Therefore, examining the alterations in basic socio-demographic features could provide convenience in clinical evaluation.

BPRS is a rating scale developed by clinicians to assess the most common symptoms and to monitor treatment response in schizophrenia. It measures the severity of various symptoms in schizophrenia and changes in these symptoms during the treatment process. It is generally used to measure changes after initiation of drug therapy. It consists of 18 items in total and requires the practitioner to know psychopathology and to conduct a purpose-oriented interview with the patient [9,10]. BPRS is mostly used in patients with schizophrenia to evaluate the symptoms that are seen in clinical practices such as somatic concern, anxiety, and affective components (depressive mood and grandiosity). This is crucial to improve the dimensional approach instead of the dichotomy.

Four-factor analysis of BPRS was also found in a study based on principal component analysis (PCA) in patients with bipolar disorder, early-onset schizophrenia and schizoaffective disorder in the course of acute and affective disease [11]. Although BPRS is a frequently used scale in the clinic, it has been used in fewer studies compared to SANS, SAPS, and PANSS [4, 12].

This study includes a trial to better understand the general clinical model of symptoms of schizophrenia with the use of BPRS. The aim of our study is to examine whether an experimental sub-dimension (anxiety, the symptoms of mania) can be developed by examining the sub-dimensions of BPRS in different age groups and genders.

Material and Methods

The data were obtained retrospectively from the patient files of the study conducted on individuals who were previously diagnosed with schizophrenia according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) in our clinic and the ethical committee approval was obtained. During the factor analysis, 199 patients were identified by excluding patients with BPRS total score ± 1 SD due to the warning about data with a variance of 0.

Mental retardation, substance, or alcohol use disorder, were regarded as exclusion criteria. This study was approved by the ethics committee of University of Health Sciences, Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital (date: 03/2019; number: 61/05). Written informed consent was obtained from the patients.

A sociodemographic data form containing age, gender, duration of disease, age at the disease onset was filled out for each participant.

Brief Psychiatric Rating Scale (BPRS)

The short psychiatric assessment scale was developed by Overall and Gorham in 1962 [9]. BPRS is a scale used in psychiatric patient groups and its main objective is to measure the changes in patients during their pharmacological treatment. The scale consists of negative (emotional withdrawal, blunted affect and motor retardation) and positive symptoms (conceptual disorganization, hallucinatory behavior, and unusual thought content). Turkish reliability study of the scale was conducted [12].

In this study, BPRS with 18 items was used to evaluate symptoms in patients with schizophrenia. Sub-items of the scale are abbreviated in the Results and Tables sections as follows B1: "somatic concern", B2: "anxiety", B3: "emotional withdrawal," B4: "conceptual disorganization", B5: "guilt feeling", B6: "tension", B7: "mannerisms and posture", B8: "grandiosity", B9: "depressive mood", B10: "hostile behavior", B11: "suspiciousness", B12: "hallucinatory behavior", B13: "motor retardation", B14: "uncooperativeness", B15: "unusual thought content", B16: " blunted affect", B17: "excitement", B18: "disorientation".

Statistical Analyses

Demographic and clinical characteristics including BPRS subscores were reported in frequencies (percent), minimum and maximum values, medians, means and standard deviations. Comparisons were analyzed using Student's t-test and One Way ANOVA.

Factor analysis (FA) using a principal component analysis (PCA) demonstrated the BPRS symptom structure model for schizophrenia. Factors having eigenvalues greater than 1 are rotated with varimax rotation method.

We used PCA to examine whether different stages per age and sex groups exist or not. Following the results of the previous study [18], we divided the study sample into three similar-sized age groups as follows: (1) ages between 18-34 (n=87; 43,72%), (2) ages between 35-44 (n=56; 28,14%), (3) ages 45 and above (n=56; 28,14%). Age groups were decided as 18-34, 35-44, and 44 and over. The purpose for this grouping is that schizophrenia is a disease that starts mostly between the ages of 18-34, and especially in men, and therefore, we can accept patients in this age group at the beginning of the disease, and to be able to make comparisons with the previous study on this subject. These groups correspond to early, middle, and advanced stages of illness according to one way ANOVA and Post-hoc LSD tests were used to analyze the pairwise comparison. Nominal statistical significance was set at ≤0,05 (two-tailed) in all tests. All analyses were done using IBM SPSS 22.0 software.

Results

Sociodemographic data

One hundred ninety-nine patients (133 males and 66 females) diagnosed with schizophrenia were included in this study. BPRS scores of the patients were 10 and more. The mean age and the standard deviation of the patients was 37.9 ± 11.2 years. The disease duration of the patients was 13.2 ± 9, and the number of psychotic attacks was 4.2 ± 3.1. The mean age of males and females were different. The mean age of the females was about five years more than males (f: 41,55/m: 36,14), (p=0,001). As a result of the T-test analysis, a comparison of BPRS scores between males and females is presented in Table 1. The average age of men and the age of onset of the disease for men was significantly lower than that of women (respectively; p<0,01).

The average of uncooperativeness, which is one of the items in BPRS, was significantly higher in female patients (p<0,01).

All of the sample analysis

Factor analysis of the Brief Psychiatric Rating Scale

The value of the Kaiser- Meyer- Olkin Measure of Sampling Adequacy was 0.73 and Bartlett's Test of Sphericity was significant (p<0.001). Totally the five factors explained 55.97% of the total variance. The attribution of individual items to factors was done by choosing the loadings >0.40. If two items were cross-loaded to more than one factor with loadings >0.40, then all those were chosen and the item was considered to load on multiple factors. The first factor contains 5 items, the second, the third and the fourth factors contain 4 items and the fifth factor contains two items. Factors were named with the terms they suited as follows: factor 1: positive, factor 2: negative, factor 3: mania, factor 4: depression±anxiety, factor 5: disorganization.

The internal consistency of the total scale was 0.67 (Cronbach's alpha value). This means that the sample was suspicious but acceptable. Descriptive statistics and comparisons of two sexes and three age groups were calculated for 18 items of the BPRS. Only the uncooperativeness (B14) score was significantly higher in females (p<0.05).

Factor Analysis based on age

Table 1 shows the comparison of BPRS items and BPRS total scores between three age groups. Guilt feelings, one of the BPRS variables, were significantly higher in the 35-44 age group compared to other groups (p<0.01). PCA resulted in a five-factor solution explaining 69.20% of the total variance in patients at an early stage of the illness (aged 18-34 years). Factor complexity was observed (B9).

Table 1. The comparison of BPRS items and BPRS total score between three age groups and gender groups

	18-34 (n=87)	35-44 (n=56)	45+ (n=56)	p	female (mean±s)	male (mean±sd)	p
somatic concern	0,91±1,24	1,18±1,31	0,98±1,38	.48	0,97±1,23	1,02±1,34	.79
anxiety	1,94±1,36	2,07±1,32	1,88±1,32	.73	2±1,24	1,94±1,38	.79
emotional withdrawal	2,92±1,04	2,96±0,97	2,52±1,24	.05	2,73±1,21	2,86±1,03	.77
conceptual disorganization	1,11±1,32	0,89±1,29	0,96±1,16	.57	1,11±1,28	0,96±1,26	.40
guilt feelings	0,64±0,91	1,14±1,37	0,57±1,17	<.01*	0,91±1,3	0,69±1,07	.45
tension	1,57±1,2	1,52±1,71	1,21±1,2	.28	1,27±1,25	1,55±1,41	.21
mannerism and posturing	0,17±0,75	0,04±0,27	0,32±0,92	.11	0,2±0,83	0,17±0,65	.18
grandiosity	0,38±0,94	0,25±0,81	0,2±0,67	.41	0,2±0,64	0,34±0,92	.78
depressive mood	1,97±1,24	2,14±1,42	1,91±1,43	.63	2,05±1,35	1,98±1,35	.21
hostility	1,2±1,37	0,84±1,29	1,27±1,43	.20	1,2±1,48	1,08±1,32	.74
suspiciousness	2±1,35	1,89±1,49	1,79±1,45	.67	1,89±1,46	1,92±1,39	.56
hallucinatory behavior	0,46±0,97	0,43±0,89	0,54±1,01	.83	0,58±1,07	0,42±0,9	.91
motor retardation	1,91±1,2	2,04±1,28	1,88±1,1	.75	2,3±1,19	1,75±1,15	.28
uncooperativeness	1,13±1,35	1,11±1,32	1,3±1,2	.66	1,41±1,42	1,05±1,21	<.01
unusual thought content	0,85±1,23	0,57±1,13	0,98±1,29	.19	0,98±1,33	0,72±1,16	.084
blunted affect	2,2±1,04	2,41±0,89	2,11±1,06	.26	2,27±1,17	2,21±0,92	.17
excitement	0,44±0,91	0,25±0,72	0,45±0,99	.40	0,33±0,87	0,41±0,9	.55
disorientation	0,05±0,43	0±0	0,05±0,4	.68	0,11±0,61	0,04±0,36	.40
BPRS total score	21,84±8,09	21,73±7,42	20,91±8,79	.78	22,5±9,35	21,08±7,36	.24

p<0,05 is highlighted as there is a significant difference between age groups.
Guilt feelings were significantly higher in the 35-44 age group compared to other groups (p<0,01).
Uncooperativeness was significantly higher in the female patient group compared to the male patient group (p<0,01).

Table 2. Factor structure of BPRS in the total sample and in different subgroups

	Items of BPRS					
Factors	**Total Sample (n=199)**	**Male (n=133)**	**Female (n=66)**	**Aged 18-34 (n=87)**	**Aged 35-44 (n=56)**	**Aged ≥45 (n=56)**
Factor 1 (positive)	B6, B10, B11, B14, B17	B6, B10, B11, B14, B17	B6, B10, B11, B14, B17	B6, B10, B11, B14, B17	B6, B10, B11, B17	B10, B11, B17
Percent of variance explained (%)	13.97%	14.32%	14.80%	15.90%	12.47%	13.63%
Factor 2 (negative)	B3, B9, B13, B16	B3, B9, B13, B16	B3, B9, B13, B16	B3, B9, B13, B16	B3, B9, B13, B16	B3, B9, B13, B16
Percent of variance explained (%)	13.41%	13.94%	14.45%	12.95%	14.65%	15.22%
Factor 3 (mania)	B4, B8, B12, B15	B4, B7, B8, B12, B15	B4, B8, B12, B15	B4, B8, B12, B15	B4, B8, B14, B15, B17	B4, B12, B14
Percent of variance explained (%)	11.74%	13.89%	12.61%	13.21%	15.11%	10.14%
Factor 4 (depression + anxiety)	B1, B2, B5, B9	B2, B5, B9	B1, B2, B5, B9	B2, B5, B9	B2, B5	
Percent of variance explained (%)	8.91%	8.35%	11.11%	9.00%	8.94%	
Factor 5 (disorganization)	B7, B18		B7, B18	B7, B18		
Percent of variance explained (%)	7.95%		11.06%	10.95%		
Factor 6		B1		B1	B1, B11	
Percent of variance explained (%)		7.13%		7.20%	7.64%	
Factor 7					B7, B12, B15	
Percent of variance explained (%)					9.70%	
Factor 8						B6, B15, B17, B18
Percent of variance explained (%)						11.57%
Factor 9						B5, B15
Percent of variance explained (%)						8.69%
Factor 10						B2, B6, B7
Percent of variance explained (%)						8.66%

BPRS = Brief Psychiatric Rating Scale
B1:somatic concern; B2:anxiety; B3:emotional withdrawal; B4:conceptual disorganization; B5:guilt feeling; B6:tension; B7:mannerisms and posture; B8:grandiosity; B9:depressive mood; B10:hostile behavior; B11:suspiciousness; B12:hallucinatory behavior; B13:motor retardation; B14: uncooperativeness; B15:unusual thought content; B16:blunted affect; B17:excitement B18:disorientation.

B18 was not included in the analysis for the patients in the group aged between 35-44 years. None of the patients in this age group had any score that is different from zero. Therefore statistics could not be computed since there was no variance. Seventeen items except for B18 were used in the analysis of the group aged 35-44 years and six factors were extracted accounting for 67.77% of the total variance. A factor complexity was observed (B11, B15, and B17 are cross- loaded on two factors).

BPRS items were loaded into five factors in the group of 45-year-old patients and older, who were at the advanced stage of illness. It was observed that two items (B6 and B17) were cross-loaded on factors. Factor loading was explaining 67.91% of the total variance, and there were some differences from the other age groups.

Factor analysis based on sex
PCA was also performed for the male and female patients and PCA resulted in five factors in both sexes in all sample groups.
In male patients, factors explained as 57.62% of the total variance. B9 was cross-loaded on two factors and B18 was not included in the analysis because male patients had no score rather than zero. In female patients, factors were explained as 64.02% of the total variance and B9 was cross-loaded on two factors similar to male patients. BPRS items used in the factor analysis were the same as the whole sample for the females. This could be a result of the absence of item B18 in male patients for PCA (Table 2).

Discussion
In this study, we aimed to examine the effect of demographic variables and symptom dimensions in schizophrenia using BPRS. In our study, emotional withdrawal and blunted affect were found to be the highest among BPRS scores. This situation may be related to the average duration of the disease in our study which was approximately fourteen years. In addition to this, the mean age of females and the mean age of the disease onset were higher in females. Again, uncooperativeness was found to be higher for female participants.

It is widely accepted that the three-dimensional model with positive, negative, and disorganization dimensions yields the most consistent model in the literature [14]. We found that the five-factor model (positive, negative, mania, depression, and/or anxiety, and disorganization symptom dimensions) provided the best solution in the whole sample. In previous studies, it was found that the anxiety/depression subgroup of BPRS is a predictor of the loss of functionality in schizophrenia [15]. Due to its contribution to the clinical view, it is important to examine the symptom dimensions in detail.

Due to the limited number of questions about neurocognitive symptomatology, information on this subject could not be obtained. Unlike PANSS study, there were no factor loadings in association with cognitive impairment. Only the first three factors explained more than 12% of symptomatology variance. Our results are consistent with the study of Dragioti et al. (2018) that examined the PANSS model, in a small sample

of 170 patients [16] and reported a six-factor solution (i.e. negative, positive, depression and anxiety, excitement and hostility, neurocognition, disorganization). However, three of their six-factors contrasted with our five factors [15].

We had similar results with previous PANSS study, clustering of factors according to age groups and gender was examined. There are many reports in the literature about gender differences. It is reported that emotional symptoms are more common in females, while men are more likely to experience psychomotor abnormalities, cognitive deficits and negative symptoms [17]. In our study, PCA regarding gender differences resulted in a five-factor solution for both sexes. Factor 1 (positive), factor 2 (negative) and factor 3 (mania) were clustered almost the same way for both sexes. In males, positive factor and negative factor were loaded in the same way as the whole sample, whereas factor 3, which was considered to be mania, mannerism and posture, was loaded differently from the total sample and females.

The uncooperativeness score was found to be higher in female patients. Although the number of female participants was approximately one-third of the total sample in our study, the factor distribution for females was loaded similar to the total sample. While somatic concern was loaded only in anxiety and depressive factor in females, somatic concern was differentiated as a factor independently in males. In female participants between 18-34 years of age, factor five was loaded as disorganization (echoes). The fact that the disorganization subtype is more common in females may be the reason behind this [18].

Although the first 3 factors were generally preserved as a result of PCA for different age groups, factor structure differences were found especially in patients aged 45 years and above. The mean score of guilt feelings was higher in the group aged between 35-44 years. Similar to the literature, although there was a statistically significant difference in guilt feelings scores according to age, there was no difference in terms of other scores. Therefore, these results suggest that further studies suggesting more complex models should be considered [19-21]. In the study, 69.21% of the total variance was explained with 5 factors for patients in the group aged between 18-34 years. For the patients in the group aged 35-44 years, 68.51% of the total variance was explained with 6 factors. Somatic concern and suspiciousness were imposed as a separate factor. The first three factors of the group aged 35-44 years were similar to the patients in the group aged 18-34 years. For patients in the group aged 45 years and above, 67.91% of the total variance was explained with 6 factors. Three factors that were not observed in other age groups were determined in this age range. While somatic concern and grandiosity were not included in the factors, tension, unusual thought, content and excitement were attributed to multiple factors.

Unlike the other age groups, tension, unusual thoughts, excitement, disorientation, were loaded as a separate factor (factor 8) for patients in the group aged 45 years and above. Again, guilt and unusual thoughts were loaded as a separate factor. Anxiety, tension and mannerism-posture were imposed as a separate factor. This may indicate that schizophrenia symptomatology should be handled differently in patients over

45 years of age than below 45 years of age.

According to our knowledge, this is the first study evaluating the symptomatology of schizophrenia with BPRS between genders and different age groups. Our study presented that there is a fifth-factor structure (disorganization) in addition to the four- factor structures that were found in a previous study on this subject [10].

After observing that the fifth factor is not presented consistently in other studies in the literature, the discovery of the fifth factor in our study is one of its strengths. One of the most important clinical conclusions is that BPRS could be a functional and beneficial tool in patients with schizophrenia. Our experimental results show that when the clinicians examine patients with schizophrenia, they should consider anxiety/depression in addition to psychotic symptoms. In the future, we want to expand our results further with additional psychiatric scales.

Limitations

Our study is a cross-sectional study that could be listed as one of its limitations. A longitudinal study will make it easier to understand dimensional symptomatology. Another limitation was the absence of untreated patients in our study.

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